U.S. Department of Transportation

United States Coast Guard

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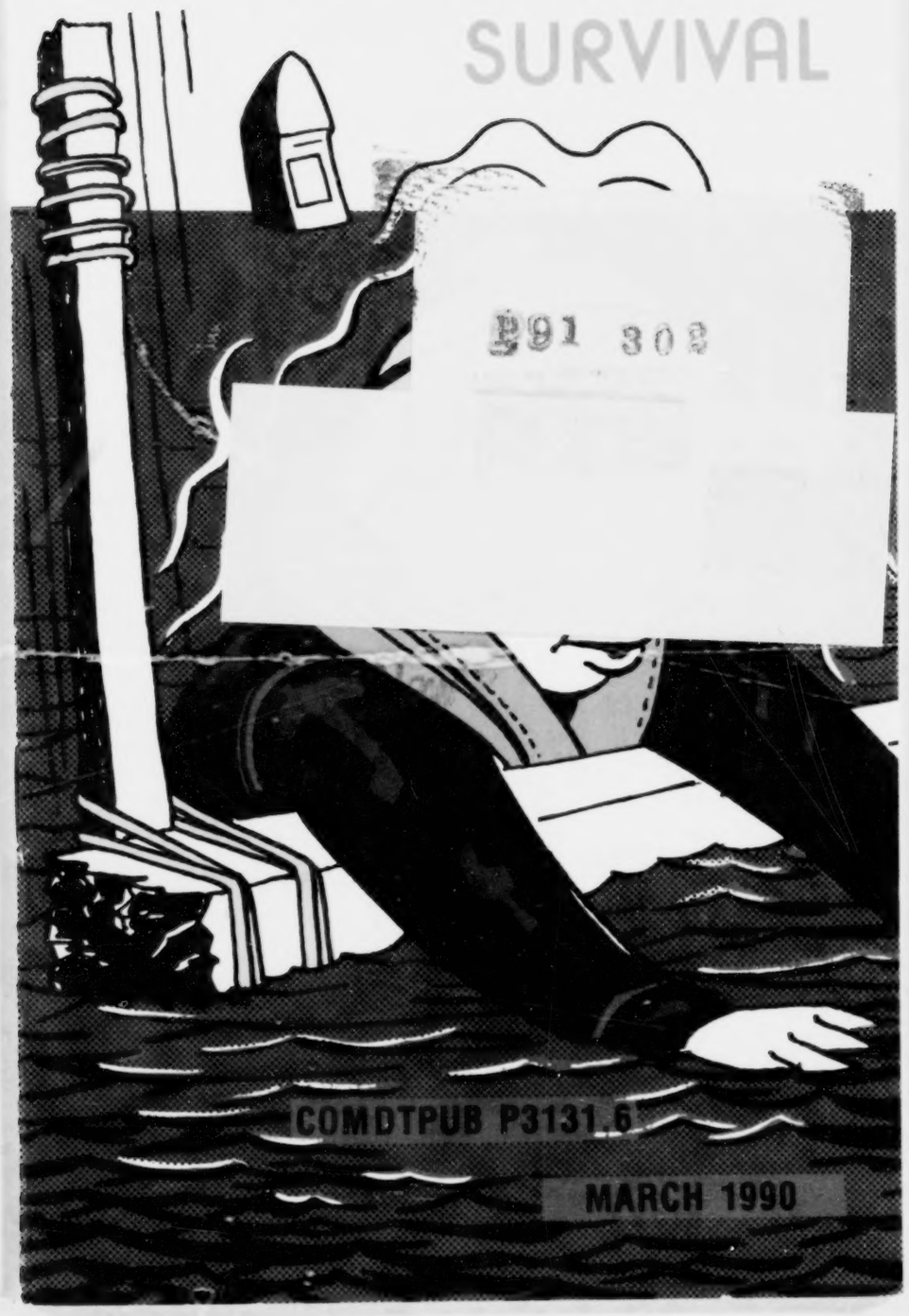
A Pocket Guide to Cold Wate...

POCKET GUIDE TO COLD WATER SURVIVAL



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INTRODUCTION

The purpose of this booklet is to examine the hazards of cold exposure that may endanger your life, and to provide you with advice on how to prevent or minimize those dangers. A thorough understanding of the information contained in this booklet may someday save your life.

No occupation is entirely safe and free from hazards. Vessels moving along the world's waterways have their own particular hazards due to the hostile environment presented by the water and its associated weather. As the season of navigation extends into the winter months, the dangers are increased by a greatly reduced water temperature and by the frequent presence of ice, snow, and lowered visibility.

The sinking of the Titanic in 1912 provided a dramatic example of the effects of cold water immersion. Partially due to a lack of preparedness with protective clothing, adequate flotation equipment, and a knowledge of survival procedures, none of the 1489 persons immersed in the 32°F (0°C) water was alive when rescue vessels arrived one hour and fifty minutes after the sinking. Countless lives could have been saved had the victims known more of how to cope with cold water. Interestingly, almost all of the people in lifeboats were alive. One needn't go back to 1912 to find examples of this tragic way of dying. For example, during the period between 1968 and 1972, there were reported cases of 73 people immersed in the Great Lakes waters. Of this number, 40 died. In other instances, there have been countless victims of cold water exposure resulting from overturned

pleasure craft, water sports mishaps, and the sinking of oceangoing vessels.

It is important to realize that you are not helpless to effect your own survival in cold water. Body heat loss is a gradual process, and, in fact recent research shows that in 40°F (4.4°C) calm water a normally dressed person can survive more than 1 hour. Simple, self-help techniques can extend this time to 3 hours or more if the person is wearing a lifevest. YOU CAN MAKE THE DIFFERENCE, and this pamphlet is intended to show you how.

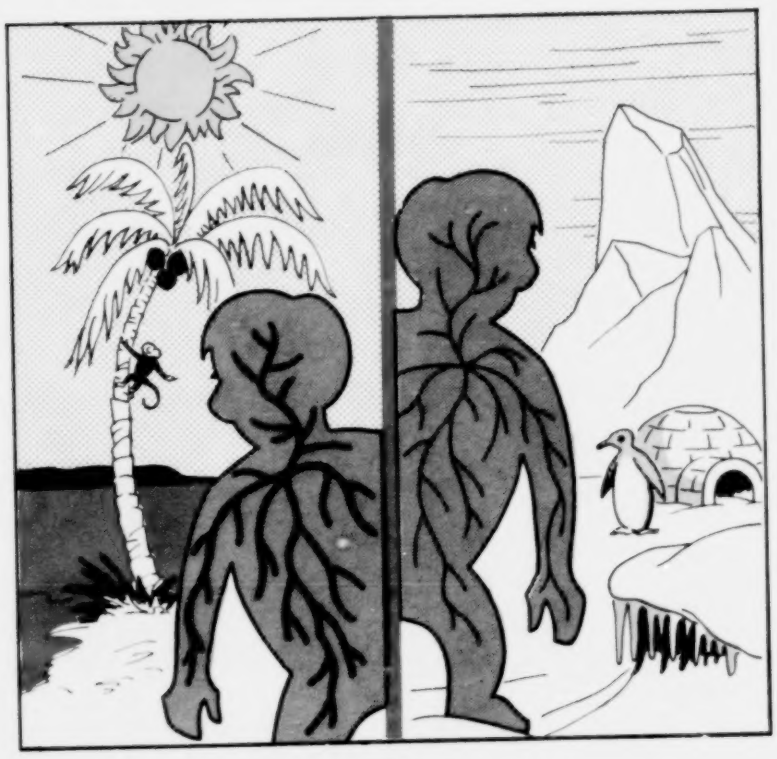
YOUR BODY

An understanding of how your body reacts to cold air or water exposure and knowing the steps you can take to help your body delay the damaging effects of cold stress, will help you in your struggle to stay alive in the event of cold water exposure.

Imagine your body to consist of an inner core and an outer layer. Within the core, your

body produces a great deal of heat as a result of normal body functions, such as digesting your food and physical exercise. This process is called metabolism.

Nature requires that your body core be kept at an ideal temperature of 98.6°F (37°C). A network of blood vessels running through the core and the outer layer of your body picks up the heat produced by the ''furnace'' within the core, and distributes that heat throughout the body. Nature also gives your body a very accurate system to automatically regulate the core temperature at 98.6°F (37°C). For example, if the temperature conditions around you are high, as it would be on a warm day or in a hot boiler room, the blood vessels near the skin of your body will enlarge, allowing more blood to flow to the skin area and give off greater amounts of body heat. This is to keep you comfortable and to keep the core temperature 98.6°F (37°C) from rising. However, if the surroundings are cool, your body will constrict your blood vessels at the skin surface and keep that valuable body heat from being lost too rapidly.



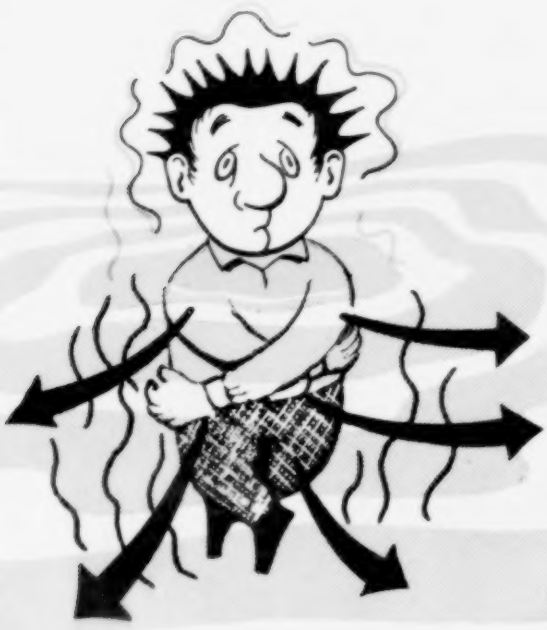
Vessels Dilated *Vessels Constricted*

The body's regulatory system, therefore, tries to keep the body's core temperature constant despite variations in temperature around you. The body can only do this within certain limits. There are levels of cold exposure, for example, where the body must have help in maintaining the core temperature at nature's choice of 98.6°F (37°C). In those cases, you must give it that help with proper and adequate insulation in the form of protective thermal clothing.

BODY HEAT-LOSS AND INSULATION

The body gives off its heat to the surroundings in the following ways:

- **Conduction** is the heat transferred by direct contact with cold water or other materials. Heat passes from your body, which is at a relatively high temperature, to a material which is lower in temperature. Certain materials are better conductors of heat than others. Water conducts



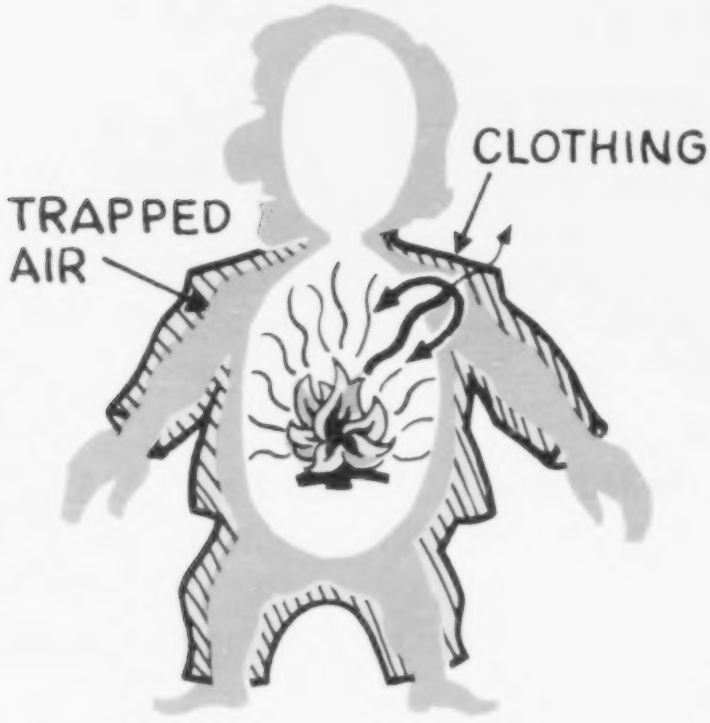
heat about 25 times faster than air.

- **Convection** is the heat transferred by air or water flow. A breeze of air at a given temperature is far cooler to the body than still air. This is known as a "windchill" effect. Similarly, a change of flow of water past your body is more chilling than still water at the same temperature.

- **Radiation** is the heat transferred by rays of energy without direct contact with other materials. In this case, the body acts the same as a radiator heating a room.

- **Evaporation** is the vaporization or ''drying up'' of moisture, such as perspiration. In this case, the body provides the necessary heat to produce the perspiration that collects on the skin surface. As the perspiration is evaporated, it takes heat with it. Although perspiration can be very useful in providing you with a comfortable cooling effect on a hot day, it can rob you of valuable body heat on a cold day.

In almost all parts of the world, man cannot survive without the aid of clothes to combat cooler climate and colder waters. Clothes by themselves don't warm the body; the body is actually warmed by its own heat production.

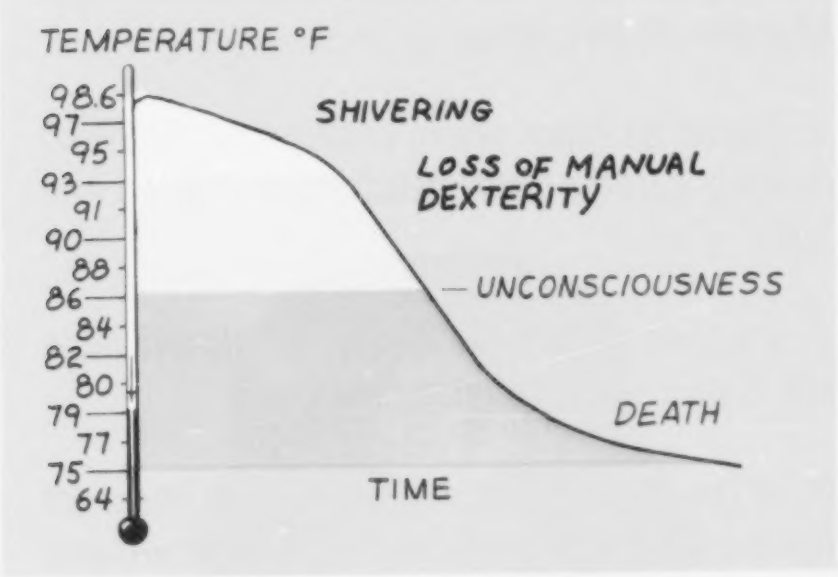


The body heat warms the layer of air trapped between the skin and clothing. It is this layer of air that provides insulation. If the layer of air is lost, then the insulation is lost. This layer of trapped air between skin and clothing may be lost through circulation or displacement by water. In either case, valuable warm air is displaced and skin temperature will fall. Heat from the body core will then be used in

an effort to maintain skin temperature. If heat loss from the skin continues, body core temperature will fall.

HYPOTHERMIA

The loss of body heat is one of the greatest hazards to the survival of a person in the sea. The rate of body heat loss depends on water temperature, the protective clothing worn, and the manner in which the survivor conducts himself. An abnormally low body core temperature can be recognized by a variety of symptoms. Very early during exposure, the body tries to combat the excessive heat loss both by constricting its surface blood vessels (to reduce heat transfer by blood to surface) and by shivering (to produce more body heat). However, if the exposure is severe, the body is unable to conserve or produce enough heat. Its core temperature begins to fall, creating a condition known as ''hypothermia''. As the body core temperature approaches 95°F (35°C), it starts to fall more rapidly. By then



discomfort, tiredness, poor coordination, numbness, impaired speech, disorientation, and mental confusion appear. As the internal temperature decreases into the 80's (below 32.2°C) unconsciousness may result, as well as a bluishness of the skin, collapse of the veins in the skin, enlargement of the pupils,

and muscle stiffness.

The heart becomes irregular and the pulse barely detectable. Although death may occur whenever the core temperature is below 90°F (32.2°C) it is very difficult to be sure whether the patient is alive or dead when the body core temperature is below 85°F (29.4°C). Death is then defined as failure to revive on rewarming.

SHIP ABANDONMENT

If you are involved in a ship casualty and are forced to abandon, your survival procedure should be preplanned, thereby increasing your chances for a successful rescue. Records show that ship sinkings, even in the worst cases, usually require at least 15 to 30 minutes for the vessel to fully submerge. This affords valuable time for preparation. Here are some sound pointers for you to remember in a situation of this type:

1. Put on as much warm clothing as possible, making sure to cover head, neck, hands and feet.

2. If an immersion (exposure) suit is available put it on over the warm clothing.

3. If the immersion (exposure) suit does not have inherent flotation, put on a lifejacket and be sure to secure it correctly.

4. All persons who know that they are likely to be affected by seasickness should, before or immediately after boarding the survival craft, take some recommended preventive tablets or medicine in a dose recommended by the

manufacturer. The incapacitation caused by seasickness interferes with your survival chances; the vomiting removes precious body fluid while seasickness in general makes you more prone to hypothermia.

5. Avoid entering the water if possible. Board davit-launched survival craft on the embarkation deck. If davit-launched survival craft are not available, use overside ladders, or if necessary lower yourself by means of a rope or fire hose.

6. Unless it is unavoidable do not jump from **higher than 5 meters (16.4 feet) into the** water. Try to minimize the shock of sudden cold immersion. Rather than jumping into the cold water, try to lower yourself gradually. A sudden plunge into the cold water can cause rapid death or an uncontrollable rise in breathing rate may result in an intake of water into the lungs. On occasions it may be necessary to jump into the water; if so, you should keep your elbow at your sides, cover your nose and mouth with one hand while holding the wrist or elbow firmly with the other

High heat loss areas

hand. One should not jump into the water astern of the liferaft lest there is any remaining headway on the ship.

7. Once in the water, whether accidentaily or by ship abandonment, orientate yourself and try to locate the ship, lifeboats, liferafts, other survivors or other floating objects. If you were unable to prepare yourself before entering the water, button up clothing now. In cold water you may experience violent shivering and great pain. These are natural body reflexes that are not dangerous. You do, however, need to take action as quickly as possible before you lose full use of your hands; button up clothing, turn on signal lights, locate whistle, etc.

8. While afloat in the water, do not attempt to swim unless it is to reach a nearby craft, a fellow survivor, or a floating object on which you can lean or climb. Unnecessary swimming will ''pump'' out any warm water between your body and the layers of clothing, thereby increasing the rate of the body-heat loss. In addition, unnecessary movements of your arms and legs send warm blood from the inner

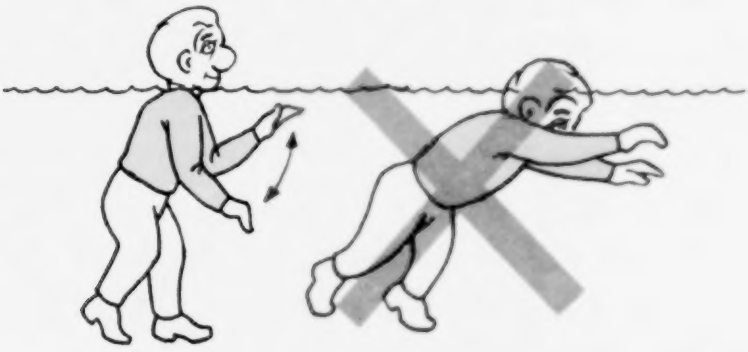
core to the outer layer of the body. This results in a very rapid heat loss. Hence it is most important to remain as still as possible in the water, however painful it may be. Remember, pain will not kill you, but heat loss will!

9. The body position you assume in the water is also very important in conserving heat. Float as still as possible with your legs together, elbows close to your side and arms folded across the front of your lifejacket. This position minimizes the exposure of the body surface to the cold water. Try to keep your head and neck out of the water. Another heat conserving position is to huddle closely to one or more persons afloat, making as much body contact as possible. You must be wearing a lifevest to be able to hold these positions in the water.

10. Try to board a lifeboat, raft, or other floating platform or object as soon as possible in order to shorten your immersion time. It is always better to get out of the water than it is to stay in.

Remember, you lose body heat many times faster in water than in air. Since the effectiveness of your insulation is seriously reduced by water soaking, you must now try to

shield yourself from wind to avoid a wind-chill effect (convective cooling). If you manage to climb aboard a lifeboat, shielding can be accomplished with the aid of a canvas cover or tarpaulin, or an unused garment. Huddling close to the other occupants of the lifeboat or raft will also conserve body heat.



11. Do not use ''drownproofing'' in cold water. ''Drownproofing'' is a technique whereby you relax in the water and allow your head to submerge between breaths. It is an energy saving procedure to use in warm water when you are not wearing a life vest. However, the head and neck are high heat loss areas and must be kept above the water. That is why it is even more important to wear a lifevest in cold water. If you are not wearing a vest, tread the water only as much as necessary to keep your head out of the water.

12. Keep a positive attitude about your survival and rescue. This will improve your chance of extending your survival time until rescue comes. Your will to live does make a difference!

MAN OVERBOARD

If you are a man overboard, you've probably caught all those who can help you by surprise — including yourself. Some useful advice to follow for preventing this situation and being better prepared is:

1. Always wear a lifevest when safety regulations require it or when you have to go on deck for any reason in poor weather.

2. Use extreme care when walking along decks, up and down ladders, and across gangplanks.

3. Use your hands to grip rails and other support devices. Do not lean on rails or lifelines.

4. Be alert when moving around the outside of the ship and especially around cable and rope. Keep hands out of pockets, free to grab for support in the event you fall.

5. Be particularly careful at night or in fog. Poor visibility increases both the chances of accident and the difficulties in locating you in the water.

6. If possible, avoid walking on an open deck in poor weather or rough water conditions.

7. Inform someone of your plan to go on deck, especially if the weather conditions are poor.

8. Walk or work in pairs, if possible. Try not to be alone.

9. Common sense says dress appropriate to the weather, but some care in selection of clothes can make a difference in survival. If possible, wear many layers of clothing, including a waterproof outer layer. Make certain that the neck, wrist and ankle portions of the clothing are snugfitting. This will reduce the exchange of water within your clothing should you go into or under water. Also, woolen clothes are better insulators than cotton,

especially when wet.

10. Carry at least one reliable distress signal with you at all times. Preferably, this should be in the form of a good quality battery powered light or chemical light stick and a Coast Guard approved whistle.

11. Wear an outer garment that is bright in color. As an alternative, sew strips of reflective tape on upper portions of your outer garment. Reflective tape is available at drug, sporting goods, or auto supply stores.

DISTRESS SIGNALS

Regardless of whether you are a man-overboard or a ship casualty victim, once you are in the water, your immediate need is to be rapidly located and rescued. Since water entry may occur at any time of day or night and in various degrees of fog and visibility, it is important for you to have some distress signal with you at all times.

Types of signals that can be easily carried include whistles, chemical lights, battery lights, mirrors or even a white handkerchief. Remember that batteries have a limited service life and require regular replacement. Use a good quality battery. Don't skimp. Another point to remember is that cold temperature reduces the effectiveness of even a fresh battery. Therefore, give the light and battery a little body warmth to improve the battery performance.

High visibility outer clothing (luminescent) or reflective tape sewn to your outer garment will reflect the beam of a rescue searchlight and prove to be a valuable detection aid on a dark night.

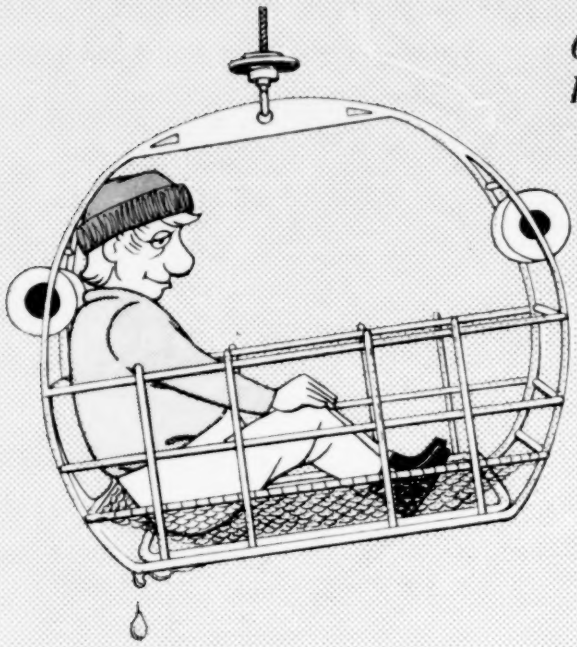
And of course the waving of outstretched arms or splashing of the water is an effective and simple signalling technique, but it should only be used when rescue is nearby. If you have a light source, moving it will enhance detection.

RESCUE

If you are a survival victim and find yourself in the water or afloat in a life boat or raft, your rescue may come about in several ways.

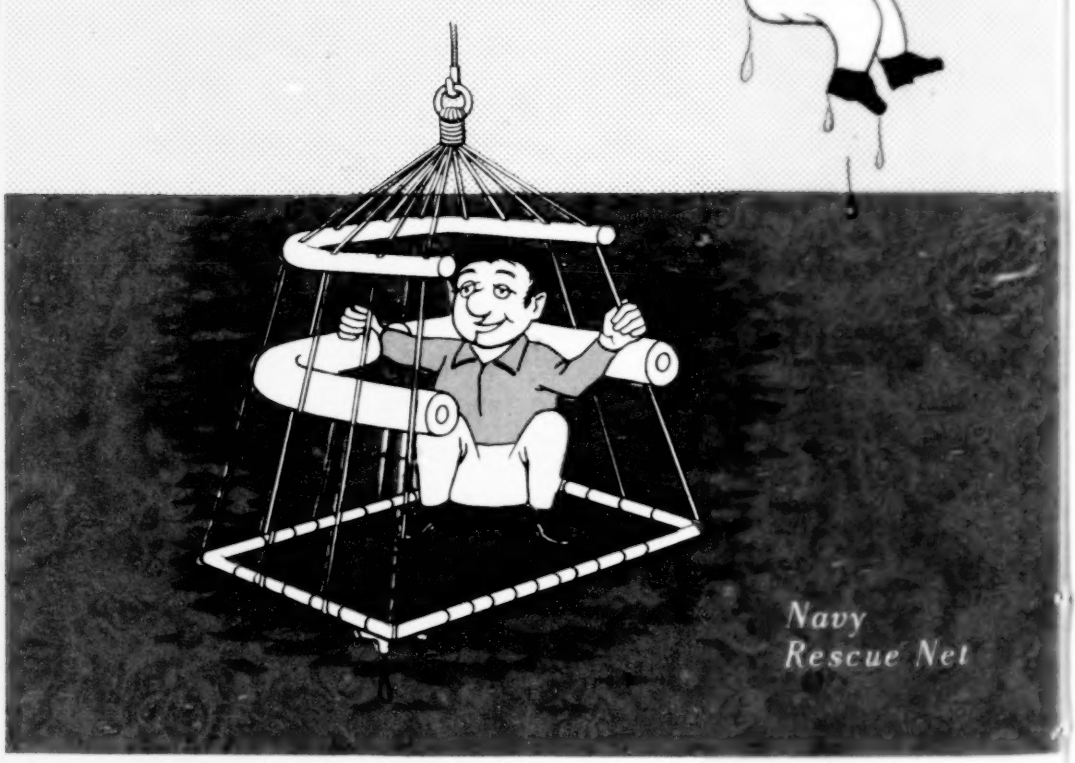
You may be sighted by a surface vessel and helped aboard by personnel of that vessel.

Rescue may also come to you in the form of a helicopter. The most populàr retrieval device in use by the Coast Guard for hoisting a water survivor is a mesh screened rescue basket. The use of the basket is rather obvious; it has an open top and all that is required of the survivor is to climb in and stay put as he is raised to safety. Although the other services have a variety of ''pick-up'' devices, ones commonly used for nonmilitary situations are the rescue sling (horse collar) and the rescue net. The rescue sling is a padded belt that is wrapped around the back and under the arms of the survivor. The two ends of the sling are attached by their looped rings to a hook at the end of the helicopter cable. The Navy rescue net is a ropelike cage with an open side for the survivor to enter and be seated while being raised to safety. No matter which approach is used, be assured that rescuers will enter the water and assist you in getting into the retrieval device if you are not able to help yourself.



Coast Guard Rescue Basket

Horse Collar Rescue Sling



Navy Rescue Net

TREATMENT OF HYPOTHERMIA

The treatment for hypothermia will of course depend on both the condition of the survivor and the facilities available. Generally speaking, survivors who are rational and capable of recounting their experiences, although shivering dramatically, merely require removal of all

wet clothes, replacement with dry clothes or blankets, and rest in a warm environment.

In more serious cases, where the victim is semiconscious, unconscious or apparently dead, contact should be made immediately with a ship or shore medical facility for detailed information on the care and handling of the victim. While awaiting medical instructions, administer the following first-aid care to the survivor, immediately:

1. After removing the victim from the cold, check for the presence of breathing and heartbeat. If the victim is not breathing and has no heart beat, immediately begin CPR (cardiopulmonary resuscitation). If the victim is breathing and you can feel his pulse, gently transfer him to a warm environment. Be sure to avoid rough handling of the victim, as this can cause further harm.

2. Remove his clothes with a minimum of movement of the victim's body; cut the clothes away with a scissors or knife, if necessary. Do not massage him.

3. Lay the unconscious or semiconscious victim in a level, face-up position. If vomiting occurs, turn the victim's head to one side. Be sure to check the victim's breathing and heart beat frequently. You must be prepared to give CPR if breathing and heart beat stop.

4. If available, administer warm, humidified oxygen by face mask. The oxygen will not only benefit victims if they are having difficulty breathing or have a low respiratory rate, but it will also provide some core rewarming.

5. Insulate the victim from further heat loss by wrapping him in a blanket. Do not attempt to aggressively rewarm the unconscious victim. Severe hypothermia is a true medical emergency, but rewarming the victim can be associated with many complications. Definitive rewarming should be attempted in a hospital. Your main goal in providing first-aid is to prevent the victim from getting colder.

6. If there will be a long delay in getting the victim to a hospital, gentle rewarming techniques may be used:

a. apply heating pads or hot water bottles under the blanket, to the victim's head, neck, chest, and groin. But never place these warm objects against bare skin since cold skin is easily burned. Keep the victim wrapped in the blanket.

b. Apply your own body warmth by direct body-to body contact with the victim. A blanket should be wrapped around you and the victim to conserve the heat you are supplying.

7. In no case should the victim be given alcohol. Unconscious or semi-conscious victims should be offered nothing to eat or drink.

SUMMING IT UP

We have briefly explained how your body responds to cold, what you can do to help ward off the harmful effects of cold, and finally, how to administer aid to hypothermia victims.

We will now sum up the story with a number of important reminders. Follow them, for your life may depend on them!

1. PLAN your emergency moves in advance! Ask yourself what you would do if an emergency arose. Where is your nearest exit to the deck for the escape? Where is the nearest available life jacket, lifeboat, or raft? How would you quickly get to your foul weather gear, insulated gloves, insulated clothing, distress signal, etc?

2. Watch your step topside, particularly in the dark.

3. Keep hands free to grab a railing or other support in the event you trip or fall.

4. Know how your survival equipment works. The emergency is not the time to learn.

5. Abandon ship in a lifeboat or raft, if you can.

6. Have a distress signal with you at all times in the event of an accidental fall overboard.

7. Wear many layers of clothing to offset the

effects of cold.

8. Do not try to maneuver on docks, gangplanks and ladders while under the influence of alcohol.

9. Put on a personal flotation device (lifevest) as soon as possible in an emergency situation.

10. If immersion in water is necessary, try to do so gradually, and if possible, ''pre-wet'' yourself in cold water to adjust to the temperature change.

11. Swimming excessively increases body heat loss. Swim only if it counts.

12. To reduce your body heat loss, float as still as possible with your legs together, elbows close to your side and arms folded across the front of your lifejacket. Do not ''drownproof''

13. If you are in a water survival situation, have the will to make it. Be confident and positive. It has made the difference between success and failure in the past.

THINK EMERGENCY !

In conclusion, advanced planning, preparation, and thought on your part can be the most significant factor in your successful struggle with cold water immersion. Be kind to yourself — START TODAY!

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